Thursday, February 14, 2019

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Joined Fast Together: e-Mobility and Laser Welding in Automotive Production

By Christian Dini, Director, Global Business Development, Ophir

Germany is said to be an automotive nation, but who can say whether e-mobility will ever establish a foothold here? Championed by politicians, contested by scientists – the future of the automobile is a subject of hot debate in Germany. In the meantime, China is leading the market for electric cars and US start-ups have completely changed the approach for building a car. Wherever the road will lead, one thing is for sure – the latest automotive manufacturing processes and e-mobility technologies are tightly linked to laser welding. This article explores where the challenges lie and why the quality of the laser beam is so important.

Especially in electric cars, weight plays a major role. Although all the components are made to be as lightweight as possible, they still need to possess the required stability. Besides radical new design approaches, like those enabled through additive manufacturing techniques using lasers, the full potential of even traditional construction methods has yet to be explored. Modern laser welding makes it possible to flexibly set welding spots and seams in automotive constructions. This allows design changes from, say, bolted to welded constructions, which result in considerable reductions in weight and space requirements – at higher strengths. Laser welding also makes it possible to reliably process and join aluminum, high-strength steel, and even new, fiber-reinforced materials.

For example, the production of battery systems for electric vehicles places particularly high demands on laser welding systems. To produce the compact battery packs, the individual cells need to be welded with high-quality welding joints in order to connect them either in series or parallel. The welded electrical contacts connecting the individual cells must be of very high quality, so that they can be configured to the desired operating voltage and capacity. Several battery modules are then combined into a block, which is safely enclosed in a sealed housing.

Fig. 1: Each battery block is carefully assembled from many individual cells.

Modern laser systems are used in these applications, as well. All welds must be executed with extreme precision and reliability at all times, because the battery has to withstand extreme stresses – like seasonal temperature fluctuations, vibrations and impacts, or even emergency situations caused by collisions. But: no battery, no mobility! Furthermore, it's

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